

directed at this. Individual lubricated encapsulation results in less friction, greater aiming accuracy, and a smaller power requirement to orient the balls.

2. In all of our prior inventions the entire multitude of mirrored balls are all collectively confined between 2 sheets and the perimeter surrounding the 2 sheets. The written specification, and the drawings all teach and show two separated sheets. The claims are all directed at two separate sheets. Because the balls are all free to move about between the two separated sheets the balls may rub against each other resulting in greater friction than in the instant invention. Greater friction reduces the aiming accuracy and imposes a larger power requirement to orient the balls.

The claims have been amended to clearly and completely emphasize that the instant invention is a manufacturing invention, and to make a clear-cut distinction from the prior art with respect to individual encapsulation of the mirrored balls. We feel that our unique invention is neither obvious, nor anticipated by the prior art, and is fully ready for allowance.

II. Specific Responses to Points Raised in Office Action Mailed June 9, 2005

The subject numbers used here correspond to those of Examiner Tra's Action. We quote his relevant statements and give our replies.

1. "Claims 1-4 are rejected"

Applicants thank Examiner Tra for giving us the opportunity to amend Claims 1 -4 to be more fully compliant. We have accordingly cancelled not only Claims 1- 4, but Claims 1 - 8 and rewritten them in new form.

2. Quotation of 35 U.S.C. 102 (e): Prior Publication.

3. "Claims 1, 3-5, 7-10 and 12-23 are rejected under 35 U.S.C. 102 (e) as being anticipated by Rabinowitz et al (U.S. Pat. 6,698,693)."

Applicants respectfully disagree. Rabinowitz et al. [neither U.S. Pat. 6,698,693 nor 6,738,176] does not anticipate these claims for many reasons. The main reason is that U.S. Pat. 6,738,176 does not deal with any production,

making, manufacturing, or fabricating processes, steps, or stages. Furthermore these references deal with a collection of balls between 2 sheets; whereas the instant invention deals with individually encapsulated balls inside 1 sheet. This distinction and its ramifications are explained in Sec. I.

a) "With respect to claim 1 ... "

It is not clear whether the cited U.S. Pat. 6,698,693 "Solar Propulsion Assist" or the previously cited U.S. Pat. 6,738,176 "Dynamic ... (Optical Switch)" is intended here. In either case, applicants respectfully disagree. Neither deal with a manufacturing process, and neither encapsulate individual balls. The former deals with enhanced rocket propulsion, and the latter deals with optical switching.

b) "With respect to claim 5 Rabinowitz et al. discloses a dynamic multi-wavelength switching ensemble... shell ... of lubricating fluid"

Applicants do not agree with the Examiner's characterization of this U.S. Pat. 6,738,176. There is no shell of lubricating fluid. Rather there is a bath of lubricant confined between two sheets together with the ensemble of balls. Furthermore it is not related to a manufacturing process.

c) "With respect to claims 3, 4, 7, 8, Rabinowitz et al further discloses wherein fluid is a lubricant (18) or dielectric fluid."

We respectfully disagree. Neither of the patents 6,738,176 or 6,698,693 satisfy the steps of the "dependent claims" of the instant invention since these steps refer to a manufacturing process, and the reference patents 6,738,176 and 6,698,693 have nothing to do with manufacturing.

d) "With respect to claims 9, 12, 13, 15, 16, and 19 ... would be inherently satisfied by the apparatus of the reference "176."

We respectfully disagree since reference "176" relates to the operation of

an Optical Switch and can in no way be construed to relate to a manufacturing process.

e) "With respect to claim 10, Rabinowitz et al. further discloses wherein at least one tray holds the mirrored balls in place in the sheet during its formation." **Neither the word "tray" nor any similar concept is mentioned in the patent 6,738,176 or 6,698,693. There is no need for a tray in these patents, or as stated in Claim 10, a "dissolvable tray." A tray is used in the manufacturing process, but is not needed in the finished product.**

f) "With respect to claims 14, 17, and 18 , Rabinowitz et al. further discloses ... wherein at least one of the infiltrating fluids is vaporously removed; wherein the ratio of the volume of the material of the sheet (5) to the volume of the mirrored balls is greater than a factor of 2."

Applicants respectfully disagree. **Neither the words nor the concept of an "infiltrating fluid" occur anywhere in 6,738,176 or 6,698,693 because it is not concerned with any manufacturing process. This is a step in the manufacturing process of the instant invention.**

Neither the words or concept "vapor" or "vaporously removed" occur anywhere in these patents because they are not concerned with any manufacturing process. This is a step in the manufacturing process of the instant invention.

Neither the word or concept "volume" or "volume ratio" occur anywhere in 6,738,176 or 6,698,693 because they are not concerned with any manufacturing process. Determining the volume ratio is a design step in the manufacturing process of the instant invention.

g) "With respect to claims 20 -23, Rabinowitz et al. further discloses wherein a random dispersion of rotatable mirrored balls (item 2) are encapsulated in the sheet; wherein the mirrored balls (2) are precoated prior to

being embedded in the sheet (5); herein the mirrored balls are asymmetrically closer to the top of the sheet (5) than to the bottom; wherein the sheet is constructed of laminar film."

Applicants strongly disagree for two reasons. First these are manufacturing steps of the instant invention that are not in 6,738,176 or 6,698,693 because no manufacturing is described there. Second the words or the concepts "encapsulated," "precoated prior to being embedded," "asymmetrically closer to the top than to the bottom," "laminar" and "film" DO NOT OCCUR anywhere in these patents.

4. "Claims 11 and 24 ... would be allowable"

We thank Examiner Tra for indicating that claims 11 and 24 would be allowable. We have made amendments that further distinguish between our invention and the cited references. Therefore we think that claims 11 and 24 are presently allowable.

5. "Applicants argued(6,698,693)"

Applicants respectfully disagree. U.S. Pat. 6,698,693 deals with Solar Propulsion Assist of a rocket, and does not deal with a manufacturing process. Thus it is irrelevant that this patent utilizes a solar concentrator. It is not concerned with the fabrication of a solar concentrator.

6. "Applicants argued in remark page 3 that patent 176' does not deal with any production, making, manufacturing or fabrication process."

Applicants believe that they have amended claims to overcome the Examiner's objection.

III. Amendment of Claims

Applicants have amended claims to further distinguish them from the cited references in accord with Examiner Tra's findings. Claims 1-8 are cancelled, and are replaced by new Claims 25-32. Independent Claim 9 has been amended as well as some of its dependent claims 18, 20, 23, and 24.

CLAIMS

Claims 1 - 8 . (cancelled)

9. (currently amended): A method for fabricating lubricating receptacles containing encapsulated rotatable mirrored balls in an optically transmissive solar concentrator sheet by means of at least one infiltrating fluid, the method comprising the process of:
- a) distributing solid mirrored balls in a solidifiable mixture to form a sheet;
 - b) a) holding said mirrored balls for concentrating solar energy somewhat rigidly captive in place in said sheet during and at the completion of its formation;
 - c) b) introducing said infiltrating fluid to expand said sheet ~~and form; and~~
 - d) ~~form forming~~ small fluid-filled individual annular cavities surrounding each said rotatable mirrored ball by the expansion caused by said infiltrating fluid.
10. The method according to claim 9, wherein at least one dissolvable tray holds said mirrored balls in place in said sheet during its formation.
11. The method according to claim 9, wherein at least one pillar supports said sheet to enhance fluid access during the sheet infiltration and expansion process.
12. The method according to claim 9, wherein at least one of the fluids is optically transmissive.
13. The method according to claim 9, wherein at least one of the fluids is a dielectric.
14. The method according to claim 9, wherein the index of refraction of at least one of the fluids approximately matches that of said sheet.
15. The method according to claim 9, wherein the density of at least one of the fluids approximately matches that of said mirrored balls.
16. The method according to claim 9, wherein at least one of the fluids is lubricating.
17. The method according to claim 9, wherein at least one of the infiltrating fluids is vaporously removed.

18. (currently amended): The method according to claim 9, wherein the ratio of the overall volume of said sheet (not including the volume of the ball cavities) to the volume of said mirrored balls is between a factor of 2 to 3.
19. The method according to claim 9, wherein at least one monolayer of said rotatable mirrored balls is encapsulated in said sheet.
- 20 (currently amended): The method according to claim 9, wherein more than one size a random dispersion of rotatable mirrored balls are encapsulated in said sheet.
21. (currently amended): The method according to claim 9, wherein the mirrored balls are pre-coated, prior to being embedded in said sheet, to achieve minimal separation between the balls.
22. The method according to claim 9, wherein the mirrored balls are asymmetrically closer to the top of said sheet than to the bottom.
23. (currently amended): The method according to claim 9, wherein said sheet is constructed of bonded laminar films.
24. (currently amended): The method according to claim 9, wherein zeolites are in the fluid bath to help keep it clean and deionized.
25. (new) A method of manufacturing a miniature optics, mirrored ball holding sheet comprising the fabrication stages of:
 - a) dispersing a multitude of solid rotatable mirrored balls in a plasticizable mixture;
 - b) forming a plastic sheet from said mixture which contains said balls with each ball individually encapsulated in the solidified sheet;
 - c) introducing an infiltrating optically transmissive fluid that is absorbed more by said plastic sheet than by said balls; and
 - d) said fluid causing the sheet to swell forming enlarged cavities that individually encapsulate each ball;
26. (new) The method of claim 25, wherein said sheet is part of a solar concentrator.

27. (new) The method of claim 25, wherein said fluid forms a lubricating shell surrounding each individually encapsulated ball.
28. (new): The method of claim 25, wherein said fluid is a dielectric.
- 29 (new) Apparatus for fabricating a miniature optics, ball holding sheet, comprising:
 - a) a hardenable fluid mixture within which are dispersed a multitude of solid rotatable mirrored balls;
 - b) means for hardening said fluid mixture containing the mirrored balls; and
 - c) means for providing an infiltrating liquid to expand the hardened mixture to form individual cavities surrounding each ball.
30. (new) The apparatus of claim 29, wherein said sheet is part of a solar concentrator.
31. (new) The apparatus of claim 29, wherein electromagnetic coupling means are provided to rotate said mirrored balls in an orientation responsive to an applied electromagnetic field.
32. (new): The apparatus of claim 29, wherein said liquid forms a lubricating shell surrounding each individually encapsulated ball.